THE ARMY AIR FORCES BOARD
Orlando, Florida

20 July 1944

ARMY AIR FORCES BOARD PROJECT NO. (T) 34.

GUNNERY HANDBOOK FOR B-29 CENTRAL FIRE CONTROL.

1. The object of this project is to prepare a suitable gunnery handbook for B-29 Central Fire Control System.

2. This project was directed by paragraph 3, letter Headquarters, Army Air Forces, Washington, D.C. dated 19 May 1944.

3. The handbook, "Gunnery in the B-29, Instruction for RCT System", has been prepared by the Armament Section, Strategic Bombardment Division, AAFSAT, in cooperation with the Army Air Forces Board, The Army Air Forces Instructors School of Flexible Gunnery and The Training Aids Division.

4. It is recommended that this handbook be adopted and published as the official source of information for instruction and use of the Remote Control Turret System. It is further recommended that the term, Remote Control Turret System (RCT), which is used in the handbook be adopted to replace the term, Central Fire Control (CFC). It is believed that RCT is a more descriptive and more appropriate designation.

5. a. Inclosure 1 - Copy of directive from Headquarters, Army Air Forces, Washington, D.C., dated 19 May 1944.
b. Inclosure 2 - Handbook, "Gunnery in B-29".

PREPARED BY:

Paul C. Droz, Lt. Col., A.C. Head, Gunnery and Special Weapons Section, Tactics Division, AAF Board.

CONCURRED IN BY:

H. G. Montgomery, Jr., Colonel, A. C. Chief, Tactics Division, AAF Board.
V. C. Huffsmith, Colonel, A.C., Chief, Armament Division, AAF Board.
G. W. McGregor, Colonel, A.C., Executive, AAF Board.

APPROVED:

For the Army Air Forces Board:

E. L. EUBANK
Brigadier General, U.S. Army
President.

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OFFICIAL:

GUSTAV A. NEUBERG,
Lt. Col, A.G.D.,
Recorder.

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May 19 1944

SUBJECT: B-29 Airplane - Doctrine of Employment.

TO : President, Army Air Forces Board, Orlando, Florida

1. Prior to this time, the B-29 airplane and plans for its tactical employment has almost wholly been in the hands of Special Project personnel and 2nd Air Force agencies concerned with training of individuals and preparing the airplane as a machine for dispatch to combat theaters. Comparatively little thought has been given to possible peculiar considerations of tactical employment which might be necessitated by the new type of fire control with which this airplane is equipped. It is now perhaps past time for the Army Air Forces Board to enter into an overall study of the tactical doctrine for the employment of this airplane.

2. It is desired that the Army Air Forces Board undertake the preparation of a manual which might bear the title "The B-29 Airplane - Doctrine of Employment", and including the following subjects:

a. Central fire control system, its status of tactical development; its combat possibilities, including its inherent deficiencies.

b. Most effective formations to effect maximum utilization of the airplane's equipment.

c. Doctrine of C.F.C. gunnery.

3. With reference to last sub-paragraph above, a review of and/or reference to the Gunner's Handbook for the B-29 Central Fire Control System, published by AAFSAT, June 1, 1944 may be in order. In compiling the doctrine indicated above, it will be impracticable to make available for the exclusive use of the Air Forces Board any additional B-29 airplanes. It will be necessary, therefore, for the Air Forces Board to develop this study by drawing on the experience of the Air Forces to date with the B-17 and B-24 airplanes, and by personal contact and conference with personnel of the 20th Air Force and the 2nd Air Force at the various stations within the U.S. where these airplanes are being prepared for dispatch, personnel and organizations being trained, and plans for employment being made. Although the Air Forces Board may expect assistance from personnel in this Headquarters, this should be considered wholly an Air Forces Board project.

4. This project is assigned first priority. It is desired that there be submitted, by 30 May 1944, all elementary conclusions that might be drawn at once and which may be of assistance to combat units, together with your plans for completing action.

By command of General ARNOLD:

H. A. CRAIG
Major General, U.S. Army
Asst. Chief of Air Staff
Operations, Commitments &
Requirements.

Incl - 1

S/F 5319-3

INCLOSURE 2 - HANDBOOK - GUNNERY IN B-29

G U N N E R Y

IN THE

B-29

Instructions for the

RCT System

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SECTION I

THE B-29 AND ITS GUNS

The B-29 is the last word in super bombers. It is 98 feet long, 28 feet high, and has a wingspread of 141 feet; it weighs over 50 tons. In the air, it looks like a skyscraper with wings and, in its own way, the B-29 is a skyscraper. It will fly its missions at well over 30,000 feet, up near the base of the stratosphere where the weather never matters and only the most modern fighters can get near it.

At that altitude the B-29 will cruise along at 325 miles an hour — fast enough to give any fighter in the world a run for its money. To catch up with the B-29, fighters will have to use so much of their gasoline that they won't have much left for making an attack. But the B-29 can fly almost forever. Its gasoline tanks hold enough fuel to fly 1,500 miles to a target, drop 10 tons of bombs, and then get back home. It is the bomber of the future — and thanks to an early start in design, it is in action right now.

For protection against attack, the B-29 has a super-system of gunnery, called the Remote Control Turret System, and usually abbreviated to RCT. The four turrets and the tail mount are all operated by remote control. The gunners sit at controls inside the fuselage, where they have plenty of room and are away from the noise and shock of their guns. Their cabins are pressurized to protect them from the effects of altitude. Their sights are connected to computers which figure out deflections automatically for any fighter within range.

.....How the RCT System works.

In the B-29's gunnery system, the places where the gunners sit are called sighting stations. From these stations, they operate the turrets according to a plan which enables them to transfer control back and forth wherever the fire power will do the most good.

The basis of the plan is shown in the following chart:

Gunner			Turret
Top			Upper Aft
		(Has	Upper Forward
		(First	and
Nose		(Call	Lower Forward
		(On	
Right)			
)	Side		Lower Aft
Left)			
Tail			Tail Mount

The nose gunner is given first call on two turrets —— which he aims with a single sight —— so that he will have maximum fire power against frontal attacks.

The two side gunners, sitting together share control of the lower aft turret. A set of switches, which either man can reach, gives control to either the right or left gunner.

Other transfers of control made possible by RCT are as follows:

When the nose gunner does not need the lower forward turret, he can let one of the side gunners take it over.

When the nose gunner does not need the upper forward turret, he can let the top gunner take it over.

The tail gunner can turn over the tail mount guns to the side gunners.

These transfers of control can be made instantaneous, by methods which will be explained later. And when one gunner is operating two turrets at once, he simply continues to use his same sight and same triggers —— he tracks and fires at the enemy plane in the usual manner, but now he has the firepower of two turrets instead of one.

For the turret or turrets on which you have first call, you are said to have primary control. For other turrets which you can operate —— if some other gunner lets you —— you are said to have secondary control.

Proper use of RCT requires good teamwork and plenty of practice. But when used properly, it enables the crew to meet attacks from any direction, and to concentrate the firepower where it will do the most good.

....Some Other Features of the B-29 Gunnery.

The B-29 has some other special gunnery features. In addition to the standard type of fire cut-off, which prevents the guns from firing into any part of the plan it has a device called a contour follower. This device automatically raises or lowers the guns to clear the fuselage or other obstructions. For example, it prevents the upper guns from ever pointing at the top sighting station —— an added protection to the man in that station.

Even charging the guns is an automatic operation on the B-29. You simply press the trigger —— and an automatic charger driven by compressed air does the rest..

....The Gunner's Job

Operating a B-29 sighting station is almost as simple as starting an automobile or dialing a telephone number. There is no turret to get into —— you simply sit down, get comfortable, and strap on a safety belt. All the switches and controls are right at hand and plainly marked.

In most respects, the job has been made easier than on any other bomber. There are so many automatic features that you will find the turret doing most of the work for you. Maintenance, on the other hand, is such a big job that gunners seldom have time or training for it — and most of it falls on the ground crew.

You will have to know all about the caliber .50 — but you've already learned that (or can read about it in the Guns Section of the Gunner's Information File. You will have to make careful pre-flight and post-flight checks. And you will have to learn a few new things like loading ammunition into these new turrets.

But all these jobs are fairly simple. There are two real tricks to being a gunner on the B-29: 1) tracking smoothly and framing accurately with the sight, and 2) working in a team with the other gunners — to get the maximum fire power out of RCT.

SECTION II.

THE SIGHTING STATION CONTROLS

The sighting stations on the B-29 are really streamlined for action. There is plenty of room, and no complicated mechanism to get in the way. Each station simply has (1) a seat for the gunner, (2) a sight with the gun triggers mounted on it, and (3) a control box with all the switches used to get the guns into action.

In some of the stations, there are one or two additional small switch boxes —— but these are all easy to reach and easy to use.

Conveniently mounted at each station are an outlet for plugging in the gunner's heated suit, a standard interphone jackbox, and a standard demand-type oxygen regulator. All this equipment is used exactly like similar units in other airplanes. There is also a valve which must be turned on so that the pressurized cabin system will operate.

All the sighting stations are operated in much the same fashion, but since there are slight differences in the control boxes, the procedure for working at each station is explained individually in this section. You will find instructions for operating each station in the following order: (1) top; (2) nose; (3) left and right; and (4) tail.

HOW TO TURN ON THE TOP SIGHTING STATION

Facts and Figures

Movement of the Top Gunner's Sight:

(Illustration: Diagrams of sighting range and cones of fire.)

The top gunner can swing his sight in a complete circle horizontally. In elevation, he can sight from a little below horizontal (-5 degrees) to straight up (90 degrees).

Turret He Has First Call On:

The top gunner has sole charge — primary control — of the upper aft turret. This turret is always under his control, and he cannot give control to anyone else.

Other Turrets He Can Operate:

The upper forward turret comes under his control at all times when the nose gunner is not using it. All switches for turning on this turret are on the top gunner's control box, and he must always help the nose gunner by keeping these switches in the proper positions.

Field of Fire of His Turrets:

The upper aft turret swings a full circle in azimuth. In elevation, it covers the entire top surface — from horizontal to straight up. The only exception is when the guns are pointed forward; in that case, the contour follower keeps them at least 11 degrees above horizontal.

The upper forward turret swings a full circle in azimuth. In elevation, it travels from a little below horizontal (-5 degrees) to straight up.

Stowing Duties:

The top gunner is responsible for stowing the upper aft turret — with its guns pointed forward and as near horizontal as the contour follower permits. Since he has all the switches for the upper forward turret, he is also responsible for stowing this turret — also with the guns pointed forward and horizontal.

Turning on the Switches in the Top Sighting Station

In the top sighting station you will sit in a swivel chair, in front of the only ring-mounted sight in the B-29. When you take your seat at this station, be careful not to damage the sight mounting — it won't support your weight and can't be used to pull yourself into the seat.

Once you are seated, take these steps in the following order:

1. Turn on the two switches marked "FWD. POWER-AUX" and "REAR POWER AUX." This will supply current to both upper turrets, the computers, to the air compressors for the gun chargers, and to the gun firing circuits.

2. Press all the power-breaker buttons at the left end of the control box.

to make sure the circuits are closed.

3. Turn on the switch marked POWER A.C. — a main power switch.

4. Turn on the COMPUTER switch. This will start your computer and the gyroscopes on your sight. Now wait at least 10 seconds to avoid overloading the circuits. Use the 10 seconds to make sure your sight is working properly. (See 3-1-).

5. Turn on the switch marked POWER FWD. This supplies current for operating the upper forward turret — be sure to notify the nose gunner, who has first call on using this turret, before turning it on.

6. After another 10-second wait, turn on the switch marked POWER REAR. This supplies current for operating the upper aft turret.

7. The other switches can now be turned on in any order you find convenient. The GUNS switches are safety switches for cutting out the trigger circuits; on the ground they should be turned on just before testing the triggers, and in the air they should be turned on just before firing test rounds and then left on for the rest of the mission. The CAMERA switches supply current to operate the gun cameras in the two upper turrets.

* * * * * * * * * * *

You are now ready to operate the sight and guns, as described in Section III. As you move your sight, the guns in the upper aft turret will follow, and your triggers will fire the guns. If the nose gunner is not using the upper forward turret, you will also be aiming and firing the front guns.

HOW TO TURN ON THE NOSE SIGHTING STATION

Facts and Figures

(Illustration: Diagrams of Sighting Range and Cones of Fire.)

Movement of the Nose Gunner's Sight:

The nose gunner can swing his sight from almost straight down (-80 degrees) to almost straight up (80 degrees). To the right he can swing the sight a little more than a half circle (185 degrees), and to the left he can swing almost a half circle (140 degrees).

Turrets He Has First Call On:

The nose gunner has first call — primary control — on the two forward turrets — upper and lower. Often he will need them both to shoot down a fighter attacking from the front. But he can also release the upper forward turret to the gunner in the top sighting station, and the lower forward turret to the side gunners. Frequently, he will release one of the turrets and keep operating the other one himself. On rare occasions, he may release both at once.

Other Turrets He Can Operate:

None.

Field of Fire of His Turrets:

The upper forward turret swings a full circle in azimuth. In elevation, it covers the entire upper surface — from a little below horizontal (-5 degrees) to straight up. At one point — when the guns are pointed straight back — the contour follower stops them before they go quite down to level (5 degrees).

The lower forward turret also covers a full circle in azimuth. In elevation, its guns move from a little above level (5 degrees at most points) to straight down (-90 degrees).

Stowing Duties:

The nose gunner is responsible for stowing the lower forward turret — with its guns pointed straight back.

Turning on the Switches in the Nose Sighting Station

At the nose sighting station, the sight is mounted on a long arm (known as a pantograph) extending from the fuselage. To begin operating the turret, unsnap the latch on this arm and swing the sight into position in front of you. Then take these steps in order:

1. Turn on the switch marked AUX.POWER. This will supply current to warm up the computer, start the air compressor for the gun chargers, and operate the gun firing circuit in the lower forward turret.

2. Above your head you will find a small switch box with toggles marked UPPER FORWARD TURRET and LOWER FORWARD TURRET. When these switches are turned to IN, you have control of the two turrets; when they are turned to OUT, the top gunner takes control of the upper forward turret, and the side gunners take control of the lower forward turret. Turn these switches to the proper position — which will be determined in combat by your airplane commander or top gunner — and notify the top and side gunners so they know what you are doing.

3. Push the power-breaker buttons at the left end of your control box to make sure the circuits are closed.

4. Turn on the switch marked POWER A.C. — a main power switch.

5. Turn on the COMPUTER switch. This starts the computer and the gyroscopes on your sight. Now wait at least 10 seconds to avoid overloading the circuits. Use the 10 seconds to check your sight. (See 3-1- .)

6. Turn on the switch marked POWER TURRET, which supplies current for operating the lower forward turret.

7. The last two switches can now be turned on in any order you wish. The GUNS switch is a safety switch for cutting off the firing circuit in the lower forward turret; on the ground it should be turned on just before testing the triggers, and in the air it should be turned on just before firing test rounds and then left on for the rest of the mission. The CAMERA switch supplies current for operating the gun camera in the lower forward turret.

The power, camera, and guns switches for the upper forward turret are all located in the top sighting station. You will have to depend on the top gunner to turn these switches.

You are now ready to operate the sight, as described in Section III, and fire the guns in either or both of the two front turrets. As long as the two switches marked UPPER FORWARD TURRET and LOWER FORWARD TURRET are both turned to IN, the guns in both turrets will follow your sight and will be fired by your triggers.

How the Nose Gunner Transfers Control of His Turrets.

If you want the top gunner to take over the upper forward turret, simply throw the UPPER FORWARD TURRET switch to OUT — he will then be aiming and firing the upper forward turret guns.

If you want the side gunners to take over the lower forward turret, simply throw the LOWER FORWARD TURRET switch to OUT.

Control of your turrets will also pass on to the top gunner and side gunners any time you take your hand off the action switch of your sight. (For a description of this switch, see page 3-1- .)

HOW TO TURN ON THE RIGHT OR LEFT SIGHTING STATIONS.

Facts and Figures

(Illustration: Diagrams of sighting range and cone of fire.)

Movement of the Side Gunners' Sights:

The left gunner can swing his sight horizontally to cover the entire left side of the plane; The movement covers slightly more than a half circle as shown in the diagram. In elevation, he can sight from straight down to about two-thirds of the way up (60 degrees). The right gunner's sight covers the same area on the right side of the plane.

Turret They Have First Call On:

The two side gunners share sole control — primary control — of the lower aft turret. They can transfer control of this turret back and forth by turning a switch placed between them. No other gunner can operate this turret.

Other Turrets They Can Operate:

The two side gunners take over control of the lower forward turret when the nose gunner is not using it. They also take over the tail mount when the tail gunner is not using it.

Field of Fire of Their Turrets:

The lower aft turret swings a full circle in azimuth. In elevation, the guns can be moved from a little above horizontal (5 degrees) to straight down. The only exception is that when the guns are pointed forward, the contour follower keeps them a little below horizontal.

The lower forward turret swings a full circle in azimuth, and in elevation its gun moves from a little above horizontal (5 degrees at most points) to straight down.

The tail mount guns move a third of the way up (30 degrees), a third of the way down, and a third of the way toward either side.

Stowing Duties:

The side gunners are responsible for stowing the lower aft turret — with its guns pointing to the rear and horizontal.

Turning on the Switches in the Side Sighting Stations

(Illustration: Photograph of the control box.)

At the side stations, the two gunners sit close enough to share a single control box. To start operating the stations, take the following steps in order:

1. Turn on the switch marked POWER AUX. This will supply current to warm

up the computers, turn on the air compressor for the gun chargers, and operate the gun firing circuit.

2. Press all the power breaker buttons at the left end of the control box to make sure the circuits are closed.

3. Turn on the switch marked POWER A.C. — a main power switch.

4. Turn on the COMPUTER switches, which start the computers and the gyroscopes on your sights. Now wait at least 10 seconds to avoid overloading the circuits. Use these 10 seconds to check your sights. (See 3-1- .)

5. Next turn on the switch marked POWER TURRET. This supplies current for operating the lower aft turret.

6. The other switches can now be turned on in any order you wish. The switches marked TAIL MOUNT AZ. and TAIL MOUNT EL., for supplying power to run the tail mount in azimuth and elevation, need not be turned on at all — for the tail gunner has the same set of switches and will be using them.

The GUNS switch is a safety switch for cutting out the firing circuit in the lower aft turret; on the ground it should be turned on just before testing the triggers, and in the air, it should be turned on just before firing test rounds and then left on for the rest of the mission. The CAMERA switch supplies power for operating the gun camera in the lower aft turret.

The other two switches on the control box have a special purpose. The one marked LOWER FORWARD TURRET is used to accept or refuse to operate that turret when the nose gunner is not using it. If the switch is turned to IN, the side gunners will take over operation of the turret as soon as the nose gunner gives it up. If the switch is out, the side gunners have no control over the turret no matter when the nose gunner does.

The switch marked TAIL TURRET works the same way for the tail mount. These two switches are chiefly for emergency use, so that the side gunners can cut out the lower forward turret, or the tail mount if they are damaged in such a way that they interfere with the operation of other turrets.

.....How the Side Gunners Work Together.....

Mounted between the two side gunners is another switch box used to transfer control back and forth. Turning these switches to LEFT gives control to the left gunner, and turning them to RIGHT gives control to the right gunner.

One side gunner or the other — depending on the position of the switch — will always be in control of the lower aft turret.

When the nose gunner is not operating the lower forward turret, the switch box can be used to let either the left or right gunner operate it. And the same thing is true when the tail gunner is not operating the tail mount. Thus, the switchs make it possible to get the greatest value from the turret guns.

In some cases the two side gunners may find that they have three turrets to operate — their own lower aft turret, the lower forward turret (when the nose gunner is not using it), and the tail mount (when the tail gunner is not using it). In that case, their transfer switches are especially valuable. For example, the left gunner might use the lower aft turret and the tail mount to shoot at an attack from the rear, while the right gunner operates the lower front turret to shoot at an attack from the right.

The action switches on the side sighting stations (see Page 3-1-) do not affect control of the turrets. Thus, if the right gunner lets go of his action switch, no one automatically takes over control of the turrets he has been operating.

Also mounted in front of each side gunner is a small box with two lights — one red and one white. The red light, marked TAIL, shines when the tail gunner is operating the tail mount. When it goes out, the two side gunners know that they can take over operation of the tail mount.

The white light, marked NOSE, shines when the nose gunner is operating the lower forward turret, and goes out as soon as the nose gunner gives up his control.

The same small box has a toggle switch which the side gunners can use to fire the 20 mm cannon when they are operating the tail mount. When the switch is off — as it should be normally — only the caliber .50s in the tail mount can be fired from the side stations. For instructions on when to turn the switch on and use the cannon, see page 4-4- .

HOW TO TURN ON THE TAIL SIGHTING STATION

Facts and Figures.

(Illustration: Diagram of Sighting Range and Cones of Fire.)

Movement of the Tail Gunner's Sight:

The tail gunner can turn his sight more than half way back toward either side (105 degrees from the centerline in either direction). In elevation, he can sight all the way from straight down to two-thirds of the way up (60 degrees). This is much farther than his guns can follow.

Turret He Has First Call On:

The tail gunner has first call — primary control — on the tail mount. When he is not using it, control passes to the side gunners.

Other Turrets He Can Operate:

None.

Field of Fire of His Turret:

The tail mount guns move a third of the way up (30 degrees), a third of the way down, and a third of the way toward either side.

Stowing Duties:

The tail gunner stows his tail mount with its guns pointing back and a little above horizontal.

Turning on the Switches in the Tail Sighting Station

The tail gunner's control box is located just to the left of the seat. To start operating the tail mount, take the following steps in order:

1. Turn on the switch marked POWER AUX. This will supply current to warm up the computer, start the air compressor for the gun chargers, and operate the firing circuits in the tail mount.

2. Push all the power breaker buttons at the left end of the control box to make sure the circuits are closed.

3. Turn on the switch marked POWER A.C. — a main power switch.

4. Turn on the COMPUTER switch, which starts the computer and the gyroscopes on your sight. Now wait at least 10 seconds to avoid overloading the circuits. Use these 10 seconds to check your sight.

5. Next turn on the switch marked POWER AZ — which supplies current for moving the turret in azimuth.

6. After another 10-second wait, turn on the switch marked POWER EL. — which supplies power for moving the guns up and down. (The equipment for moving

the tail mount requires so much electricity that two switches are provided to avoid a sudden drain on the power system.)

7. The other switches can now be turned on in any order you wish. The GUNS switch is a safety switch for cutting out the firing circuit in the tail mount; on the ground it should be turned on just before testing the triggers, and in the air it should be turned on just before firing test rounds and then left on for the rest of the mission. The CAMERA switch provides power for operating the tail mount gun camera. (If your sighting station has a MANUAL CHARGE switch, check with your specialist. The equipment it operates should have been removed from the B-29.)

You are now ready to operate the sight and guns, as described in Section III. The tail guns will follow your sight and fire when you press your triggers. You can fire the 20 mm cannon along with the caliber .50s by turning on a small toggle switch mounted near the sight. (For instructions on when to use the 20 mm, see Page 4-4 .)

As soon as you let go of the action switch on your sight (described on page 3-1), control of your guns will pass to the side gunners.

SECTION III.

THE SIGHT

(Illustration: Half-page photograph, close-up view of gunner at his sight.)

The sight used on the B-29 — called a retiflector sight — is connected with a computer mounted away from the sighting station. Working together, the sight and computer figure out deflection automatically for any fighter, regardless of whether he is attacking you or not. They can be used to shoot at any enemy within range, no matter whether you see him head-on, from the side, or from the top or bottom.

Part of the information the computer needs is supplied by the navigator of the plane, who operates a hand set in which he sets the bomber's indicated air speed, the pressure barometric altitude, and the outside temperature. This enables the computer to figure out the bomber's true air speed; it also shows how thick the air is and therefore how long it will take your bullets to reach the fighter.

The rest of the information you must supply. You will (1) set in the fighter's wingspan by turning a target size knob; 2) track the fighter to give the computer his motion, and 3) frame the target by turning a range handle so that the computer can work out the distance between you and the fighter.

Two kinds of sights, identical except in minor details, are used on the B-29. In the top sighting station, the sight is mounted on a ring and operated with two grip-type handles. All other stations have sights mounted on pedestals and operated with two hand wheels.

In both sights, your chief interest is in the optic head which has a small glass plate through which you will do your sighting. Looking through this plate you will see a reticle made up of a small circle of orange dots, with another dot in the center. You will also see a dial which must be set for the wingspan of the fighter.

This section of the manual describes the sight in full, tells how to turn it on and track with it, how to take care of it, and how to use it if the computing unit gets out of order.

HOW TO TURN ON THE SIGHT

(Illustration: Photographs of ring and pedestal sights, with parts labeled to correspond with text below.)

Both types of B-29 sights are turned on and used in the same manner. The POWER-A.C. switch on the sighting station control box lights the double-filament reticle bulb. The COMPUTER switch on the control box starts the gyroscopes (A) and the computer unit.

After the COMPUTER and POWER-A.C. switches are on:

1. Turn the rheostat (F) to adjust the reticle to proper brightness. Flip the filament switch (G) to make sure both filaments of the reticle bulb work.

2. Turn the computer standby switch (I) to IN. This cuts the computing mechanism into your circuits.

3. Make sure the warning light (J), which shines when the computer is at standby has gone off.

NOTE TO TAIL GUNNERS: On your sight, the standby switch is locked in the IN position and there is no warning light.

4. Remove the azimuth stowing pin (B). This will enable you to move the sight sideways. If the sight is too hard to move, or moves too easily, use the azimuth friction adjustment (C). To make the adjustment, simply use a wrench to loosen the lock nut and then turn the screw with a screwdriver. Turning the screw clockwise tightens the adjustment.

5. Remove the elevation stowing pin (D) to permit up and down movement of the sight. If necessary, use the elevation friction adjustment (E).

6. If necessary to avoid glare, pull down one or both of the sky filters (H).

7. Grasp the two hand wheels (K) — or two handles (K-1) on the ring mounted sight. By moving them, you can turn the sight in any direction. With one hand, press the action switch (L or L-1). Unless this switch is held closed, the turret guns will not follow your sight; moreover, a gunner with secondary control will be able to take over your turret.

If you have turned on all the necessary switches as explained in Section II, you are now ready to start tracking and shooting at enemy planes. With the pedestal type sight, the controls you will use are the target size knob (M), the range wheel (N), and triggers (O) pressed by your thumbs. On the ring mounted sight, you will use the target size knob (M), a motorcycle type range grip (N-1), and a single trigger (O-1) operated by your right index finger.

HOW TO TRACK AN ENEMY PLANE

(Illustrations: Drawings of reticles and planes in various positions.)

As far as the results are concerned, the computer attached to your sight works something like an adding machine. If you feed it the right information, it will come up with the right deflection. If you make a mistake, the sight will get the wrong answer.

Your tracking and framing of the target must be absolutely on the nose. Learn how to do the job right, and then practice every chance you get. Even a three-day layoff between missions may make you too rusty to score hits.

Follow these rules:

1. Be sure your body —— especially your upper arms from elbow to shoulder —— is well braced. You have to keep a steady hand on the sight, and must have plenty of support but absolute freedom of movement for your wrists and fingers.

Getting well braced is as important as knowing how to use a rifle sling.

2. Use the friction adjustments to give the sight just the right "touch". You will find that there is just one right setting for you —— if the adjustment is just a little bit tighter, or a little bit looser, you will have trouble tracking smoothly. If you will be wearing gloves in combat, make the adjustment while wearing gloves —— the "feel" of the sight is far different to a gloved hand.

3. Under glare conditions, use as little sky filter as possible —— turn up the rheostat all the way and then use just enough filter to make the reticle clearly visible. Remember that the filters cut down your chances of seeing the enemy clearky.

4. As you look through the optic head, keep both eyes open and just a few inches behind the glass. Two eyes are better than one.

5. Learn to recognize enemy planes at a glance, and to recall their wingspan without even thinking. As soon as you see an enemy, turn the target size knob until you see the proper wingspan figure in your reticle.

6. Turn the range wheel or range grip smoothly to keep the fighter's wingtips just framed by your reticle circle. Try for a smooth, steady, easy motion which will keep the circle just the right size at every instant.

(If you see target from the side, remember that on most fighter planes, the fuselage is a little shorter than the wingspan. Keep the reticle circle just a little bit beyond the ends of the fuselage.)

7. Keep the center dot of your reticle right on the middle of the fighter —— track smoothly and continuously. Once you have started tracking, don't change your grip on the hand wheels or hand grips until you knock down the fighter or he flies out of view.

If your aim gets a little wrong — if you fail to move the dot along with the fighter or go past him — don't jerk the dot back to place. Move it back into line slowly. Remember that smoothness is your goal. Don't fire while your aim is incorrect — if you get off the target, get off the trigger.

Rules 6 and 7 are the most important of all. UNLESS YOU TRACK SMOOTHLY AND FRAME ACCURATELY, YOU MIGHT AS WELL NOT HAVE TURNED ON THE SWITCHES AT ALL.

...A Combat Tip

At the start of a mission, set the target size knob to show the wingspan of the type of fighters you are most likely to meet, and turn the range wheel until the reticle circle is as small as it will get. You will then be ready for action. If the enemy planes turn out to be of a different wingspan, you can change the target size setting in a hurry.

If you make an error in setting the target size knob, and don't have time to change it during the attack, you can make a correction as you frame the target. If the dial setting is larger than the actual wingspan, keep the reticle circle a little beyond the wingtips. If the dial setting is too small, let the wingtips overlap the circle a little.

While you are scanning the skies for enemy planes, don't move the sight. This is important because every movement of the sight sets the computer to working out deflections —— and you don't want the computer to be working on a make-believe problem when you need it.

When you sight an enemy plane, slew the sight around quickly to line it up with the plane. If you move the sight into line slowly, you will keep the computer busy working out deflections for an imaginary attack —— remember that every time you move the sight, the computer thinks you are actually following an attacking plane. The faster you move the sight and guns into place, the less time the computer will take to get to work on the real problem.

When the enemy plane's wingtips just touch the smallest reticle circle, you can get by turning the range wheel, he is about 1,200 yards away. Considering the bullet pattern of your caliber .50s, this is too far for your most effective shooting. Moreover, you will have to track the plane for at least a second or so to give the computer time to figure deflections. Don't waste ammunition —— begin firing at the opening range and with the length of bursts recommended in your combat theater.

AT ALL TIMES, KEEP YOUR BURSTS DOWN TO THE LENGTH ADVISED IN YOUR THEATER. This will help you make every round of ammunition count. It will also help prevent "cook offs" (see Page 4-6-1).

A Note for Tail and Side Gunners

As you use your sight, you will see that you can move it farther than your turret guns can follow. This additional range is a great advantage — it enables you to get a head start tracking an enemy plane before he is actually in your cone of fire.

As soon as the target gets to a point where your guns can reach him, the guns will be ready to fire. If you have been tracking him smoothly, the computing unit will be ready with the right deflections from the first burst on.

THE COMPUTER WARNING LIGHT

(Illustration: Close-up photograph of warning light.)

The computer warning light at the left side of the optic head is designed to prevent slip-ups in using the computers. If you forget to turn the computer standby switch to in, or accidentally turn it to standby while using the sight, this light will flash on.

In the top and nose sighting stations, the computer automatically cuts out when the sight is raised to about 80 degrees or more, - and the warning light flashes on. As soon as the sight is lowered, the computer cuts back in and the light goes off. If your warning light flashes in this manner, either (1) go after a different enemy plane, or (2) turn around in a half circle and try tracking your target from the other side.

In the side sighting stations, the computer cuts out in similar manner when the sight is lowered to about -80 degrees. If your warning light flashes on under these circumstances, go after a different target.

NOTE: On the tail mount there is no warning light. The tail gunner will have to check the position of his computer switch.

EMERGENCY SIGHTING METHODS

....If the Computer Breaks Down

The computers on the B-29 are sturdily built and well protected by armor-plate; you should rarely, if ever, have a case of computer failure during combat.

But if your computer should break down, you can still use the sight as an extremely accurate ring sight for applying the rules of Position Firing. Since the size of the ring is adjustable by moving the target size knob, you can use it to lay off accurate deflections which will take into account your true air speed.

If your computer fails in combat, follow these rules:

1. Turn off your COMPUTER switch and turn the computer standby switch to standby.

2. Ask the navigator for your true air speed. Then set your target dimensions dial according to the table printed on this page. (Be sure a copy of the figures is pasted up at your sighting station so that you won't have to rely on memory. The figures vary from station to station to allow for the distance between the sight and the guns.)

3. Turn the range wheel or grip until the reticle circle is as large as possible. On pedestal sights, pull out the range wheel to keep the setting.

4. Use the sight like an ordinary optical sight to apply the standard rules of Position Firing, with this one exception —— for planes attacking at 90 degrees, allow 2 1/2 rads deflection instead of 3. (This gives a more accurate deflection at the B-29's high speeds.)

5. If your bomber is moving along steadily and not taking evasive action, use the standard rule of laying off deflections between the fighter and your tail along the fighter's line of apparent motion.

6. If you are taking evasive action, lay off the deflection along an imaginary line between the fighter and the point on the horizon toward which your tail is pointing.

7. Start firing at the opening range and with the length of bursts recommended for Position Firing in your combat theater. Since 800 yards will usually be the range at which you start firing for keeps, little pasteups of fighter planes should be provided on your window to show how big fighters look at 800 yards.

8. On the breakaway of an attack, if the fighter seems to hang motionless in the air, hit him by using this system:

Top or tail gunner aims point blank.

Nose or side gunner aims 1/2 wingspan toward the nose of the bomber.

S/#5319-28 (Diagram to illustrate the above.)

HOW TO SET THE TARGET SIZE KNOB FOR POSITION FIRING IN THE B-29

True Air Speed of Bomber	Top Gunner Operating		Nose Gunner Operating either or both of his Turrets	Side Gunner Operating			Tail Gunner Operating Tail Mount
	Upper Rear Turret	Upper Front Turret		Lower Rear Turret	Lower Front Turret	Tail Mount	
200	51	62	51	48	62	41	51
225	58	68	58	56	68	49	58
250	66	75	66	63	75	57	66
275	73	81	73	71	81	66	73
300	80	87	80	78	87	74	80
325	88	94	88	86	94	82	88
350	95	max	95	94	max	90	95

.... If the Reticle Bulb Burns Out

If both filaments of your reticle bulb burn out and you have no spare, you will have to rely on an emergency ring and post sight, which you will find mounted on the optic head where it can easily be pulled into position.

This emergency sight is too small to use as a ring sight for laying off deflections in rads. Its only value is as a reference point to show where your guns are pointing.

SECTION IV.

OTHER INSTRUCTIONS FOR USING THE REMOTE CONTROL TURRET SYSTEM IN COMBAT.

(Illustration: Half-page photograph of a B-29 or B-29 formation in flight.)

This section contains all the instructions for operating an RCT station which have not been discussed in previous sections. Included are:

Safety Rules for Transferring Control of a Turret
Avoiding Self Inflicted Damage
How to Stow a Turret
The Power Breaker Buttons
When to Use the 20 mm Cannon
Avoiding "Cook Offs"

SAFETY RULES FOR TRANSFERRING CONTROL OF A TURRET

(Illustration: Drawing to show turret firing as it slews.)

As soon as the nose gunner or tail gunner gives up control of his turrets, these turrets will swing right into line with some other gunner's sight. If this gunner has his finger on the trigger, the guns will fire as they swing into position —— and may throw slugs into some other bomber in the formation.

To avoid accidents, follow these rules:

NOSE GUNNER: Always notify the top gunner and wait for an okay before you turn your UPPER FORWARD TURRET switch to OUT. Always notify the side gunners before you throw your LOWER FORWARD TURRET switch to OUT. In combat never take your hand off the action switch —— not even for a moment's rest —— without getting an okey from the top gunner and the side gunners.

TAIL GUNNER: Never take your hand off the action switch in combat without getting an okey from the side gunners.

TOP AND SIDE GUNNERS: Take your finger off the trigger when notified that you are getting control of another turret. Don't press the trigger until the new turret has lined up with your sight. (Takes a couple of seconds.) If you are shooting at a fighter and can't safely stop firing, just wait until you can safely stop firing before you give your okey.

SIDE GUNNERS: When you transfer control back and forth to one another, take equal care to avoid hitting friendly planes.

AVOIDING SELF-INFLICTED DAMAGE

(Illustration: Diagrams to show how line of fire differs from line of sight. This will be shown for beam attack and for frontal fly-through.)

Self-inflicted damage — which means bullet holes in one of our own planes from one of our own guns — is always a possible danger when bombers fly in formation. Take every precaution to avoid it — <u>if you have to take your choice between letting an enemy fighter go, and running the risk of firing into another friendly bomber, let the fighter go every time.</u>

There are no hard and fast rules for avoiding self-inflicted damage. The main thing is to understand what happens to your guns when you sight, and then to use your own good judgment in every case.

In most cases, your knowledge of position firing is a good guide to what happens to your guns. As you keep your sight centered on an attacking plane, your computer sets in deflections very similar to those used in position firing. This means that your line of bore is often very different from your line of sight.

The maximum deflection which the B-29 computers can set in is about 200 mils,* or more than 11 degrees. The top diagram on this page shows a case where you might get this maximum deflection.

You would also get a very large deflection when firing at a beam attack, as shown in the bottom diagram. In both cases note how you might be firing at a bomber in your own formation without realizing it — unless you keep remembering that your computer is setting in deflections.

<u>Allow a safety zone around every bomber in your formation. As soon as your sight gets into this zone, take your finger off the trigger.</u>

(Illustration: Diagram of B-29 with safety zone around it.)

* A mil, it will be remembered, is the angle formed by two lines which are 1 foot apart at 1,000 feet, as shown on Page S-33 of the Position Firing Section of GIF. A 1-degree angle is equal to nearly 18 mils.

HOW TO STOW A TURRET

(Illustration: Diagram of B-29 with all turrets stowed)

Stowing the turret guns on the B-29 is a simple operation —— but the steps must be taken in the right order.

1. Run the guns to their stowing positions. For the upper turrets this means guns pointing straight forward. For lower turrets, and the tail mount, it means guns pointing aft.

2. Push in the azimuth and elevation stowing pins of your sight, to hold the turret in exactly the right place.

3. Turn off the switch marked POWER TURRET. (On the tail mount, turn off both the POWER AZ and POWER EL switches.)

4. Release the action switch. DO NOT LET GO OF THIS SWITCH UNTIL THE POWER SWITCH IS OFF.

Now the guns are properly stowed and will not move until the switches are thrown back and the action switch held down. You can now move the sight without making the turret move.

Automatic Stowing.

In all turrets except the tail mount, the guns will automatically go to their elevation limits as soon as the action switches operating the turret are released. But this is only a safety feature and does not take the place of the stowing procedure described above. The guns will not go to their proper stowing position in azimuth until you move them there.

Even if the power system fails, the two lower turrets can be stowed by hand. On the lower forward turret remove the well cover as described on Page 5-1-2. If the turret has hand-operated safety switches, turn them to SAFE. Then open the azimuth and elevation latches as described on Page 5-1-1, grasp the back end of the guns, and move them by hand to their stowing position. On the lower aft turret, follow the same procedure —— except that there is no well cover to remove.

THE POWER BREAKER BUTTONS

.....How They Operate
.....How to Reset Them

The power breaker buttons on the B-29's control boxes operate like fuses; when a circuit is overloaded or overheated, the breakers pop open and cut off the current.

If a turret suddenly stops moving, the chances are that one of these breakers has gone into action. To reset the breaker and start the circuit working again:

1. Turn off the power switches (both A.C. and TURRET, or in the tail sighting station A.C., AZ., and EL). Unless you turn these switches off, the breaker reset buttons will pop out again as soon as you reset them.

2. Push hard on the power breaker buttons.

3. Turn the power switches back on, allowing 10 seconds between each switch.

Remember that the power switches and buttons for the turret you are operating will not always be found at your sighting station. In that case, call the proper sighting station on the interphone and have that gunner reset the buttons. The following chart shows the position of the power switches and power breaker buttons for each turret.

Turret	Switches and Power Breaker Buttons on following Control Boxes
Upper Forward	Top
Lower Forward	Nose
Upper Rear	Top
Lower Rear	Side
Tail Mount	Tail

WHEN TO USE THE 20 MM CANNON

(Illustration: Diagram showing how trajectory of 20 mm cannon varies from trajectory of caliber .50 MG.)

The 20 mm cannon in the tail mount of the B-29 fires an explosive shell which packs a terrific wallop. The cannon has a long barrel and a relatively slow rate of fire which make it especially accurate. It serves as a good piece of "heavy artillery" to put the finishing touches on an attacking plane.

But the cannon must be used sparingly, and at times when it will do the most good. It carries only 125 rounds of ammunition — enough of the cannon's rate of fire (8 to 10 rounds per second) for about 14 seconds of actual firing.

The caliber .50's in the tail mount carry enough ammunition for about 75 seconds of actual firing. So if you fire the 20 mm cannon every time you fire the caliber .50's, you will run out of cannon ammunition while you still have four-fifths of your machine gun ammunition left.

To save 20 mm ammunition, the best method is to wait until an attacking plane is within relatively close range before you turn on the 20 mm firing switch. At close ranges, you will have your best chance of hitting with the cannon shells — and of knocking the enemy out with a single clean hit.

At long ranges your 20 mm cannon won't hit a thing — because its bullet drop is so much greater than the caliber .50's as shown in the diagram. The computer allows for the bullet drop of the caliber .50's; it does not allow for the much greater drop of the 20 mm cannon.

Wait with the 20 mm cannon until the enemy is in much closer range — not more than 600 yards. Then, as the diagram shows, there is practically no difference between the bullet drop on the 20 mm and the caliber .50.

The closer the fighter is when you flip on the cannon, the better your chances of making every one of those 125 rounds count.

REMEMBER:

1. Don't just leave the 20 mm firing switch on at all times.

2. Rely on your caliber .50s for fighters at long range.

3. Don't cut in the cannon until the fighter is up close — the closer the better.

AVOIDING "COOK OFFS"

(Photo of guns cooling at 30°)

Since the opening range of your machine guns on the B-29 is so great, there is always the danger that you may fire so many rounds during a single attack that your guns will be overheated —— and will fire after you release the triggers. You will have to take special care to avoid such "cook offs" —— which endanger your own bomber and all others in the formation.

Cool the guns at every opportunity. Whenever you fire as many as 50 rounds within a short period, look for the first possible chance to cool the guns during a lull in the fighting. Move them right out into the slipstream —— pointed forward or aft and at a 30-degree angle from horizontal —— and hold them there. This is the best position for effective and even cooling of the barrels.

Cool them for 10 full minutes if you have time. Remember that you can be scanning the skies just as well with the guns in this position as in any other.

****

IF YOU DO GET A RUNAWAY GUN, don't get panicky. Point it away from your own plane and all other bombers in the formation. Usually straight up or straight down will do the trick.

Then flip the GUNS switch to safety. This may stop the gun. If not, throw the switch back on —— to keep your other gun ready for action —— and let the bad gun run out.

SECTION V.

GETTING READY FOR A MISSION.

(Illustration: Half-page photograph of upper gunner seen through plexiglas, while another man works on the upper rear turret.)

Before every mission, the operation of each sighting station must be checked from stem to stern —— the sight must be working properly, the computing unit must be calculating its deflections, and the turret must respond to every move of the sight.

In addition to this test of how your sighting station is working, several other steps are necessary to prepare the B-29 for a mission. You will probably also be assigned a turret to take care of —— and on that turret you will have to pull off the dome and gun enclosure, put back the guns or gun parts that you have removed for cleaning, make sure that the guns and gun chargers are working properly, and test the fire interrupter system. You will have to know how to load ammunition into the turret and get the gun camera ready.

All these pre-flight jobs, and the various methods of making sure all the turret and sighting station equipment is working properly, are described in this section —— in the order they are usually taken up before the mission.

Some of these jobs may be done in your theater by the ground crew —— but know them anyway. Be ready to help the maintenance men, or to backstop them if they make a mistake. Be sure you KNOW that all the jobs have been done and that your equipment is ready. Your life depends on it.

THE TURRETS AND HOW TO GET AT THEM

(Illustration: Photo of turret showing dome, access doors, gun enclosure and well.)

To get at the turret guns and load ammunition into the turret, you will have to remove the dome, the gun enclosure, and the well cover.

To Remove the Turret Dome....

1. Open the turret access door labeled ELEVATION LATCH. This door is held by two Dzus fasteners which can be opened by turning them a half turn with a screwdriver.

(Illustration: Photograph of solenoid latch open and same latch closed.)

2. Beneath the access door you will find the elevation latch (see illustration). Open it. You will now be able to move the turret guns up (or down) by hand.

3. Move the guns about 30 or 40 degrees away from horizontal, until you can easily get at the dome handle.

(Illustration: Hand opening door handle.)

4. Release the safety catch on the dome handle by pressing it back, and then turn the handle. The turret dome can now be pulled off.

(Illustration: Hand removing turret dome.)

(Illustration: Photograph of turret with dome removed and azimuth latch visible.)

By releasing the azimuth latch —— just as you released the elevation latch —— you can now move the turret by hand in any direction.

To replace the dome, simply reverse these steps. Don't forget to close the azimuth and elevation latches.

To Remove the Gun Enclosure....

(Illustration: Photograph of gun enclosure showing the locking pins.)

Simply release the four small lock pins by pulling them out (by hand) as far as they will go. (On lower turrets, you will first have to open two Dzus fasteners.) Then slip the enclosure off over the gun barrels.

To Remove the Turret Well Cover...

(Illustration: Photograph showing hand removing the latches from turret well.)

Open the latches which held the cover in place —— and the cover will come off.

(Illustration: Photograph showing the automatic safety switches on the turret well. Also a photograph showing the non-automatic safety switches at the lower rear turret.)

The Turret Safety Switches...

On some turrets, removing the well cover automatically throws on safety switches which cut off the turret driving power and the firing circuits —— insurance that the turret won't move, or the guns fire, while you are working there.

On the lower aft turret, the safety switches must be operated by hand. Be sure they are on SAFE while you are working on the turret —— and are turned back to the IN position before you take off on a mission.

Special Instructions for Upper Turrets....

On the upper turrets, the well cover catches all used cartridge cases and links. It will have to be cleaned out after the mission.

Special Instructions for Lower Turrets....

(Illustration: Photographs of ejection doors closed and ejection doors open.)

On both lower turrets, there are special ejection doors to get rid of the cases and links. The doors operate automatically, opening when the guns start firing and closing after firing stops. The doors must be checked before a mission —— they should open as soon as the trigger is squeezed, and close a few seconds after the trigger is released.

THE TAIL MOUNT —— AND HOW TO GET AT IT

(Illustration: 1) Photo of tail mount with housing installed; 2) Photo of bulkhead door closed.)

To Remove the Tail Mount Housing....

(Illustration: Photo of hand opening air-lock fasteners from canvas covering.)

1. Remove the canvas dust cover by opening the air-lock fasteners which hold the canvas to the tail mount cowling.

(Illustration: Photo of hand loosening air-lock fasteners on fairing.)

2. Open all air-lock fasteners on the two side fairings, starting at the bottom.

(Illustration: Photo of hand lifting hinged fairing at top of mount and exposing fasteners on main cowling piece.)

3. Lift the hinged fairing at the top of the mount, so that you can get at the air-lock fasteners on the main cowling piece. Then loosen these fasteners.

(Illustration: Photo of hand lifting off the main cowling.)

4. Lift off the cowling.

To replace the housing, simply reverse these steps.

To Open the Bulkhead Door

(Illustration: Photo of hand which has just opened bulk-head door.)

Remove three wing nuts. This will enable you to open the door and get at the back of the guns.

After the door is opened, you will see two hand brakes —— one for azimuth and one for elevation —— which work like the azimuth and elevation latches on the turrets. By loosening these brakes —— you will have to open two latches on each brake —— you can move the tail mount guns by hand.

The Tail Mount Safety Switches...

Opening the bulkhead door automatically opens safety switches which cut off all tail mount power and the firing circuits —— insurance that the guns won't move or fire while you are working on the tail mount.

S/F 5319-41

CARE OF THE CALIBER .50s

(Illustration: Photo showing caliber .50s mounted in turret.)

There is one theoretical disadvantage of the RCT system: because the guns are mounted where you can't easily get at them in flight, a malfunction is hard to repair once you leave the ground. If one of your caliber .50s stops working, it may well be out for the duration of the mission.

Your job, in caring for your guns, will be to keep this disadvantage a theoretical one —— not an actual one. Take such good care of the guns and keep them so clean that you will never have a malfunction.

Use the guns section of this manual as your bible. If you clean the guns yourself, do it carefully and thoroughly. Keep a sharp eye out for burrs, wear and tear, or defective parts. Be extra careful when you adjust the oil buffer, the oil buffer adjusting screw, and especially head space. Remember that careless headspace adjustments cause more gun trouble than anything else in the book.

If the armament section takes care of the guns in your combat theater, try nevertheless to make your own check on the condition of the guns. Check the adjustments —— especially headspace. Make sure the guns have been cleaned as well as you would do the job yourself, and watch for any burrs that might have been missed.

....How the Guns Are Mounted.

For use in the B-29, the caliber .50s are mounted in Edgewater adapters. They are then held in place in the turret by a slider mount bolt on the rear trunnion and by bolts holding the front trunnion mount of the adapter.

The guns feed from the outside —— that is, the right gun feeds from the right and the left gun from the left. The special automatic chargers are mounted on the inside. Other special equipment consists of feed guides and chutes go get rid of the used links.

Be sure your guns are assembled to feed properly. The square end of the sear slide must be toward the charger, or the guns won't fire.

....Field Stripping the Guns for Cleaning

Ordinarily only the "guts" of the guns are removed for cleaning. Remove the back plate and the driving spring. Then lift the cover and use the extractor to pull the bolt back until the bolt stud hole lines up with the hole in the receiver and pull out the barrel assembly.

To do this job, you will have to lower the guns as far as possible if you are working on an upper turret, or raise the guns as far as possible if you are working on a lower turret or the tail mount.

To keep harmonization accurate, the "guts" should always be put back in the same casing they were removed from.

..... Charging the Guns by Hand

(Illustration: Photo of hand charging tool; also photo showing how it is used to charge guns.)

When checking headspace, adjusting the charger, or loading ammunition into the guns, you will have to charge them by hand. One easy method is to use a hand charging tool — which is just like a screw driver with the end bent out at right angles. Hook the tool into the bolt stud port on the side of the gun opposite the charger. Then pull back sharply and flip the end of the tool away so that the bolt can spring back to position.

The guns can also be charged by hand by using a screw driver on the charger, as described on Page 5-4-1.

.....Removing the Guns

If the entire gun should ever have to be removed from the turret, the mounting system used on the B-29 makes the job easy. On the turrets, disconnect all the cables and air hoses from the charger, loosen the feed guide assembly and link chutes, and then loosen the bolts from the front trunnion mount of the Edgewater adapter.

Then lift the front end of the gun slightly and push it back to release the slider mount at the rear. You can then pull the gun right out.

On the tail mount, the method is the same except that you will have to remove the bottom nut (but only this one nut) from the bolt of the rear slider mount.

After the guns are put back in the turret, they must be lined up properly. By leaving one gun in the turret while you work on the other, you can make this job much easier for the ground crew.

CARE OF THE GUN CHARGERS

The automatic gun chargers on the B-29 do two jobs. First, they charge the gun, then they fire the gun by releasing the firing pin.

The chargers operate with compressed air. As soon as you turn on the POWER-AUX switch, a motor starts working and builds up air pressure; the motor stops automatically when the pressure is high enough and starts working again when the pressure goes down.

(Illustration: Wash photograph to emphasize salient parts of air compressor, hose and charger system.)

When you press the trigger, the charger goes to work. If the gun has already been charged, the charger releases the firing pin. If not, it pulls the bolt back to charge the gun. If something goes wrong and the gun does not fire, the charger will keep operating for about four seconds. Then, since further charging would obviously be useless, an automatic timer cuts it off.

.... Testing the Air Compressor

(Illustration: Photograph of oil port on air compressor, showing oil at full level.)

Before every mission, the motor of the air compressor should be checked. It should start operating as soon as the POWER AUX switch is turned on, and should continue to operate for about five minutes —— when the air pressure will be high enough —— before cutting off automatically.

The air compressor must be full of oil. Open the oil port and make sure there is oil up to the very top.

.... Checking the Air Hoses

(Illustration: Photo of hand checking charge hoses.)

For the charger to work properly, all the air hoses must be tightly connected and free from leaks. The connections must be tested before every mission, and soapy water should be rubbed over the hoses to make sure they are not leaking.

.... Using the Charger to Charge and Fire the Guns by Hand.

(Illustration: 1) Photograph of hand using screwdriver in charger's C socket; 2) Photograph of hand using screwdriver in charger's F socket.)

One method of hand charging the guns — for convenience in pre-flight adjustments and checks — was described on Page 5-3-2. Another method is provided on the charger itself. By putting a screwdriver in socket C, and pushing the handle of the screwdriver toward the muzzle of the gun, you will charge the gun once.

To release the firing pin of the gun, place a screwdriver in socket F and push the handle of the screwdriver toward the breech end of the gun. This will trip the firing solenoid.

.....Adjusting the Charger

(Illustration: Photograph of hand turning charger's sear pin adjuster, while other hand holds go gage between barrel extension and receiver of gun.)

The charger on the B-29 must be adjusted so that it will release the gun's firing pin properly. The method:

1. Turn the sear pin adjuster on the charger as far clockwise as you can.

2. Charge the gun by using a charging tool as described on page 5-3-2 or by putting a screwdriver in the C socket of the charger. With the sear pin adjuster turned fully clockwise, you should not hear the firing pin of the gun release — if you do, report it to maintenance.

3. Now turn the sear pin adjuster one notch counterclockwise and again charge the gun and trip the solenoid. Repeat this process until you come to a notch where the firing pin of the gun will release.

4. Turn the sear pin adjuster two more notches counterclockwise. This will give you a working adjustment of the charger. But whenever possible, the adjustment should be checked with the standard GO (.116) and NO-GO (.126) gage described in the guns section of the GIF. The method:

5. Place a GO gage between the barrel extension and receiver of the gun.

6. Making sure the POWER-AUX and GUNS switches at the sighting station are on, have someone press the trigger. You should hear the firing pin of the gun release.

7. If you don't hear the firing pin release, turn the sear pin adjuster one notch counterclockwise and try again. Keep this up until you find a notch where the firing pin releases with the GO gage in place.

8. Then place the NO-GO gage between the barrel extension and receiver of the gun. Have your helper press the trigger and make sure the firing pin does not release.

.....Resetting the Charger

(Illustration: Photo of finger pressing charger's reset button.)

The automatic timer, which cuts off the gun charger after four seconds of operation, can be set back to zero by pressing a red RESET button at the back

of the charger. Always press this button when you leave the turret — or the timer may be "run down" so far that you will not be able to charge your guns in flight.

This reset button is not at all like the power breaker reset buttons on your control box. Its only job is to put the timer back to zero, so that it will operate four full seconds before cutting off. Press it every time you are through working on the charger, and press it again as your last step before putting on the turret dome before a mission.

CARE OF THE 20 mm CANNON

(Illustration: Photo of 20 mm mounted in tail mount.)

To a gunner who is used to the caliber .50, the tail mount cannon is a strange kind of fish. It is amazingly long and heavy, and its cartridge weighs a full half pound. It doesn't even operate like the caliber .50 —— instead it works on the "gas and blowback" principle, which means that some of the gases created by the explosion are fed back into the gun to provide a push for a recoil action which travels much farther than the caliber .50.

Learning how to take the cannon apart, clean it, and repair malfunctions is a science of its own. So the whole job is left to ground crew experts, and all the gunner has to know is how to operate the gun.

The performance characteristics of the cannon, and the best way to use it, have already been explained on page 4-5-1. The only other important facts —— to the gunner —— are the methods of charging the cannon and clearing it after a mission.

.... How to Charge the Cannon

Unlike the caliber .50, the cannon must be charged by hand before it will fire the first time. For this operation, you will find a charging cable which ends in a parachute-type handgrip. To get at the handgrip, open the bulkhead door of the tail mount and reach in. To charge the cannon, brace your feet, take hold of the grip with both hands, and pull back as far as you can.

This operation will pull the bolt back and leave it there. When you press your gun trigger —— with the 20 mm switch turned on —— the bolt will move forward, pick up a round from its special feeding mechanism described in the instructions for loading the cannon (see page 5-15-1), and fire the round. The recoil action will leave the gun charged and ready to go again.

.... How to Clear the Cannon

When you press the trigger after charging the cannon, you send an electric current through a solenoid which releases the bolt and lets it slam back into battery; the firing pin then releases automatically. You don't have to adjust this solenoid —— just leave it alone.

CHECKING THE FIRE INTERRUPTERS

All B-29 turrets —— but not the tail mount —— are equipped with fire interrupters, which cut off the guns whenever they are pointed at parts of the bomber.

To test this operation of the fire interrupters, move the guns by hand to point at all parts of the bomber within their range —— the wings, fuselage, propellers, and tail. At each danger point, have a helper press the triggers, while you stand at the turret to make sure the firing pins of the guns are not released.

Be sure there is no ammunition in the guns when you make this test. The GUNS switch, of course, must be on.

ADJUSTING AND CHECKING THE GUN CAMERAS

(Illustrations: Photographs of gun camera and magazine with parts labeled.)

All sighting stations or turrets on the B-29 are equipped with gun cameras to make a photographic record of the combat mission. When the camera switch on the control box is on, the camera will start taking pictures as soon as the triggers are pressed. It can be set to stop taking pictures as soon as the triggers are released, or to keep exposing film for up to three seconds afterward.

When the camera is set to operate for a short time after the triggers are released — as it usually is in combat — it contains just about enough film to last through a mission in which all ammunition is fired. So be careful not to waste film — for example, be sure the camera switch is off while you fire test rounds.

When the camera switch is on, automatic heaters inside the camera will keep the mechanism warmed up. To avoid heating the camera needlessly, use the camera switch only when necessary. You will receive instruction before the mission, or from the airplane commander during the mission, telling you when to turn the switch on.

To prepare the camera for a mission:

1. Make sure the shutter speed knob and the index ring on the lens are set to 16. (This adjustment sets the camera for 16 frames a second, the proper speed in the B-29.)

2. Set the diaphragm ring for the kind of weather you are likely to run into. Set it to B for bright weather, H for hazy, or D for dull weather.

3. Be sure the lens and filter are clean. Remove dust with a camel's hair brush, and clean the lens and filter if necessary with a piece of lens tissue or clean, lintless cloth. You can breathe on the glass surfaces to help clean them — but never use water, cleaning fluid, or alcohol.

4. Set the overrun control for the amount of time you want the camera to operate after you release the triggers. (Your combat theater will have a standard amount of time to allow, or you will receive special instructions for each mission.)

5. During the pre-flight check of your guns and charger, turn on the camera switch to check operation of the camera. It should start as soon as the triggers are pressed, and when the triggers are released it should stop after the correct amount of overrun.

6. Just before the take-off, load a fresh magazine of film into the camera. The method:

First release the magazine access cover of the camera by pressing the eccentric knobs forward. Then pull open the cover.

Insert the magazine with its film opening toward the camera lens, and its footage indicator toward the side of the camera which is mounted to the turret or guns.

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Pull up the magazine latch as far as you can, and then close the access cover. Finally, push in the footage indicator knob on the camera body and turn it until the dial reads "50" —— which is the number of feet of film in a fresh magazine. After the camera has been used, the dial will show how many feet of film are left.

CHECKING THE SIGHT

Except for the kind of respect demanded by any precision device, your retiflector sight will require little special care. Your main job is to see that it is clean and in working order before every mission. If something goes wrong, trained maintenance men will have to make the repairs --- don't attempt to make them yourself.

Before every mission:

1. Make sure the optic head is clean.

2. Make sure the computer warning light and both filaments of the reticle bulb are working.

3. Turn the rheostat from dim to bright and make sure the reticle responds.

4. Make sure the reticle circle is clear --- if it looks blurred or foggy, report it.

5. Sight at some distant object, move your head, and make sure the dot stil seems to be on the object no matter where you hold your head. If the dot and object don't stay together, notify maintenance.

6. Turn the target knob throughout its range and make sure the figures in the reticle move with it.

7. Test the range wheel or grip by moving it back and forth and watching for the size of the reticle circle to change.

8. BE SURE THE FRICTION ADJUSTMENTS ARE JUST RIGHT FOR SMOOTH TRACKING. If you will wear gloves on the mission, test the adjustments with gloves on. If you will be working with bare hands, make the test without gloves.

Cleaning the Sight

In cleaning the optic head, be careful not to scratch the glass surfaces. Use a camel's hair brush or some other soft brush to get rid of dust. Clean the surfaces with a soft cloth or tissue paper. If you can't get the surfaces clean with a dry cloth, use plain water, a solution of some neutral soap, or alcohol.

Replacing Light Bulbs

(Illustration: Photographs to show replacement of bulb.)

After one filament of the reticle bulb burns out, install a new bulb as soon as you have a chance. The method:

1. Loosen the two thumbscrews at the back of the sight.

2. Slip off the rear cover, being careful not to break the bulb.

3. Remove the old bulb by turning it slightly.

4. Insert a new bulb, and flip the toggle switch to make sure both filaments work.

5. Replace the cover and tighten the thumbscrews --- do not use pliers on these thumbscrews.

If the computer warning light burns out, replace it by the same method. Carry at least one spare bulb of both types on every mission.

TESTING THE TURRETS WITH THE COMPUTER AT STANDBY

(Illustration: Diagrams showing how far to slew the guns in turrets and tail mount.)

As far as the operation of the turret is concerned, the first check is to make sure the turret guns move --- smoothly and without any lag --- when the sight is moved. This test is made with the COMPUTER STANDBY switch in standby position, so that the computing unit is cut out. (A similar test, described on Page 5-12-1, is made later with the computing unit in operation.)

On the turrets, movements will be checked in azimuth, in elevation, and then in both at the same time. At each sighting station, every turret which can be controlled from that station will be tested in this manner.

After turning on the power switches, move the sight slowly in azimuth only, and make sure that the turret guns follow it smoothly, without jerking. Then release the action switch, move the sight about 45 degrees in azimuth, and press the action switch back down. Make sure the guns slew around quickly and move into line with the sight.

Then try the same thing in elevation. Make sure the guns follow smoothly as the sight moves slowly up and down. Release the action switch, move the sight about 45 degrees, up (or down), and press the action switch back down. Make sure the guns slew rapidly into line.

To check azimuth and elevation motion together, slowly move the sight diagonally and watch for the guns to follow. Then release the action switch, move the sight diagonally about 45 degrees, press down the action switch, and watch for the guns to slew into line.

ON THE TAIL MOUNT, the check is exactly the same --- except that you will have to stay within the limits of the guns' 60-degree range of movement. When you move the sight with the action switch released, to make sure the guns will slew into position when the switch is pressed back down, don't bang into the limit stops --- keep the sight a little inside the 60 degree range.

CHECKING THE LIMIT STOPS

(Illustration: Drawings showing how to test the limit stops in upper turret, lower turret, and tail mount.)

All turrets and the tail mount in the B-29 have mechanical limit stops --- built like rubber bumpers --- to keep the guns from traveling too far or banging into the fuselage. They also have a set of automatic switches which cut off most of the power when the guns reach the limit stops, leaving just enough current to hold the guns firmly in place against the stops. When these switches go into action, they also prevent the guns from firing.

To test this equipment before the mission, move the sight until the guns hit the limit stops. Make sure the guns remain firmly seated against the stops. Then reverse the movement of the sight. As you bring the sight back into the range of the guns, make sure the guns back away from the limit stops and begin to follow th sight smoothly.

On the upper turrets, you will test the limit stops by swinging the sight down until the guns hit the stops.

On the lower turrets, you will make the test by swinging the sight up.

On the tail mount, you will have to make the test in all four direction --- up, down, left, and right.

.... Another Kind of Limit Stop

The upper turrets also have mechanical limit stops which keep them from traveling past 90 degrees straight up when you raise the guns, and the lower turrets have stops which keep them from traveling below -90 degrees straight down when you lower the guns. These stops are simply bumpers --- there are no switches to cut off the turret power.

If your sight is installed properly, you will not be able to bang the guns against these limit stops hard enough to damage anything --- the sight will reach its limit of movement just as the guns barely touch the stops. Check before each mission to make sure. Raise the sight as far as possible for lower turrets. If the guns bang into the stops and you still seem to have some play in the sight, notify the maintenance section.

CHECKING THE CONTOUR FOLLOWERS

(Illustration: Drawing of B-29 fuselage and four turrets, showing points at which contour followers go into action.)

All four turrets on the B-29 --- but not the tail mount --- are equipped with contour followers which automatically raise or lower the guns when they get to certain positions. When the contour followers are in action, an automatic switch keeps the guns from firing.

On the upper turrets, the contour followers are designed to keep the guns from ever pointing at the top sighting station. On the lower turrets, the contour followers keep the guns from pointing into the curved fuselage.

To test the operation of the contour followers, move the sight until it is horizontal, and then swing it in a full circle in azimuth. Watch the guns as they follow the sight:

On the upper forward turret, the guns should rise slightly as they move toward the rear. On the upper aft turret, the guns should rise slightly as they move toward the front. Make sure the guns in both upper turrets rise far enough so that they never point at the top sighting station.

On the lower forward turret, the guns should lower slightly when they are pointed back and on the lower aft turret the guns should lower when they are pointed forward. Make sure the guns on both turrets lower sufficiently to clear the fuselage.

TESTING THE TURRETS WITH THE COMPUTER CUT IN

(Illustration: Drawings showing how turret and tail mount guns should move when computer standby switch is thrown to standby.)

After the computer switch is turned on, and the computer standby switch thrown in, the operation of the turrets and the tail mount must be checked again to make sure they work properly when automatic deflections are fed to them.

This test is very similar to the check made with the computer at standby (described on page 5-9-1). Move the sight in azimuth, then in elevation, and then diagonally, and make sure the guns follow smoothly. Then test the turret's slewing action by releasing the action switch, moving the sight diagonally about 60 degrees and pressing the action switch down again. Make sure the guns slew right into line.

Once you are satisfied that the guns are following the sight and slewing properly, make two additional checks which will show whether the computer is controlling the guns as it should.

1. Swing the sight in azimuth and then stop suddenly. Then swing the sight in elevation and stop suddenly. In each case, the guns should stop and then move back slightly in the opposite direction.

2. <u>For turrets</u>, turn the range wheel until the reticle circle is as small as possible, move the sight until it points straight out to the right or left, and then --- with the action switch still held down --- throw the COMPUTER STANDBY switch to standby. The guns should jump slightly to the rear. Throw the switch back in; the guns should jump forward again.

Now point the sight straight back and throw the COMPUTER STANDBY switch to standby. The guns should drop slightly. Throw the switch back in: the guns should lift up again.

<u>For the tail mount</u>, move the sight until it is pointing straight back, turn the range wheel until the reticle circle is as small as possible, and then --- with the action switch still held down --- turn off the COMPUTER switch. The guns should drop slightly. Turn the switch back on: the guns should lift up again.

CHECKING THE STOWING LIGHTS

(No illustrations)

Because it would be extremely dangerous to land the B-29 without the tail mount and the two lower turrets properly stowed, three warning lights are mounted in the pilot's compartment. These lights go out when the guns in the lower turrets or tail mount are stowed.

The lights must be checked with the pilot airplane commander before each mission. Put the lower forward turret in stowing position while the pilot checks to make sure its warning light goes off, then move the turret again while the pilot watches for the light to flash on. Do the same with the other lower turret and the tail mount.

LOADING THE CALIBER .50 AMMUNITION

(Illustration: Diagrams showing how ammunition belt is loaded into cans for upper and lower turrets and for tail mount.)

Ammunition for the caliber .50s is carried in large cans holding about 1,000 rounds for each gun. The cans for the upper turrets, lower turrets, and tail mount vary slightly; the proper method for folding the ammunition belt into each is illustrated in diagrams on this page.

Before loading the cans, make sure the ammunition is in good condition, free from short rounds, and properly belted. Remember that a jam due to bad ammunition can't readily be corrected after the take-off.

The method of placing the cans in the turret varies slightly.

For Upper Turrets....

Set the loaded ammunition can under the turret, with the ammunition pointing to the center of the turret and the side handles of the case locked down.

(Illustration: Hand inserting ball end of hoisting cable into top handle of a loaded ammunition can for upper turret.)

Then insert the ball end of the turret hoisting cable into the top handle of can, as shown. Let the locking pin slide back into place and make sure the cable is held tightly.

(Illustration: Photograph of one man pulling hoisting cable while another guides can into place.)

The next step is easier with two men —— one to pull on the hoisting chain while the other guides the can into place. Make sure that all four latch bolts holding the can snap into place.

(Illustration: Hands coiling up hoisting rope and putting it in stowing position.)

Finally stow the chain under the leather holding strap on the frame assembly.

(Illustration: Hand threading ammunition belt through upper feed roller assembly.)

To load the belt into the gun's feedway just before takeoff, reach down, thread the belt through its roller, and lift up about 1 1/2 feet of the belt. Then thread the belt through the upper feed roller assembly, as illustrated and push the first round into the gun and against the belt holding paw. Charge the gun once by hand to move the first round against the cartridge stops --- and the gun is ready for action.

For Lower Turrets....

Hold the loaded ammunition cans above the turret, with the rounds pointing toward the center of the turret, and simply lower them into place until the latch bolts snap into position.

(Illustration: Hand threading ammunition through the spiral feed chute assembly.)

To load the belts into the guns just before the takeoff, you will have to go outside the plane and thread the ammunition belt through the feed chute assembly and down through the guide rods. Then push the first round into the gun and against the belt holding paw, and after you have done this, replace the ammunition can cover. As soon as the gun is charged once by hand --- to move the first round against the cartridge stops --- it will be ready for action.

For the Tail Mount....

The cans for the tail mount, located just forward of the gunner's compartment cannot be removed; the ammunition belts must be taken inside the plane to be folded into the cans.

To feed the belt into the gun, push the first round over the belt in the ammunition can and then into the feed track. Force the belt along the track and into the sprockets of the booster motor. Then go outside the plane and pull the belt over the sprockets, through the plastic rollers, and over the belt feed rollers. You will then be able to press the first round onto the gun's holding paw. Charge the gun twice --- and it is ready for action.

LOADING THE 20 mm CANNON

Ammunition for the 20 mm cannon is carried in a curved can which sits over the breech end of the gun. An ammunition belt, linked together just like a belt for the caliber .50s, travels from the can through a short feed chute to a special feeding mechanism mounted right on the gun. On the counter recoil action, the gun picks up a round from the feeding mechanism and fires it.

One peculiarity of the 20 mm is that the ammunition must be oiled -- an operation that would only make for trouble in any other gun used by the army. Before loading, the entire feeding mechanism must be dipped in oil and then allowed to drain, and each cartridge case must be thoroughly coated by using a rag soaked with oil. If you oil your own ammunition, be careful not to get oil on the primer or the cannelure where the cartridge case is bent in to hold the projectile.

To load ammunition:

1. Remove the feed chute which connects the ammunition can to the feeding mechanism. This chute is split down the middle, you can remove it easily by opening the latch at the top center and pulling the two halves apart.

2. Pull down the latch at each end of the ammunition can and lift the can out. Take off the lid, which is held by a latch at each end.

3. Remove the feeder mechanism, which is latched to the magazine slide of the gun. Pull up on the latch lever, then lift the back end of the feeder mechanism and push it to the rear to release the pins which hold its front end to the gun.

4. Now load the ammunition belt into the can. At one end of the can is a handwheel used to pull the belt out of the can; this end goes on the right side of the gun, (or on your left side as you look into the tail mount from the outside of the plane). Start folding in the belt with the single-link end at this end of the can, and with the rounds pointing toward the muzzle as the can will be mounted on the gun. The open side of the links must face down.

5. As you finish folding in the belt, you will wind up with the double-link end lapping over the same end of the can where you began. Push the double-link end through the chute and into the sprockets operated by the handwheel. Turn the wheel clockwise until two rounds have come through the chute and handwheel from the can. Then replace the cover.

6. For the next step, you will need an extra belt of 18 rounds of ammunition to use as a feed strip. Push the double-link end of this feed strip into the belt guide of the feeder mechanism with the open side of the links toward the mouth of the feeder. Keep feeding in the belt by hand until the first round appears in the mouth, where it will be held by the retainer. If you have trouble, your feed strip is improperly linked.

7. Using a wrench, turn the ratchet on the outside of the feeder mechanism to wind up the driving spring which operates the mechanism. Get the spring tight

and then --- as in winding a watch --- don't apply any more pressure.

8. Replace the feeder mechanism on the gun, first sliding the front end against the hooks which hold it, and then catching the rear end in the magazine slide latch. Make sure the link opening fits properly on the tail mounts link ejection guide.

9. Put the can back in the turret and latch it in place.

10. Now use a single round of ammunition to make a connection between the two rounds hanging from the ammunition can and the rounds hanging from the feeder mechanism.

11. Replace the feed chute by sliding the two halves over the belt and latching them together.

HARMONIZING AND LEVELING THE TURRETS

On the B-29's RCT system, where the guns are sometimes as much as 41 feet away from the sight, the guns and sight must be harmonized perfectly for the computers to do their work --- without absolutely accurate harmonization you won't hit a thing.

An equally important operation on the B-29 is leveling the turrets --- that is, making sure they are absolutely parallel to one another and at right angles to the line of flight. Unless this job is done carefully, by a crew using spirit levels, your aim will be off.

You can't do these two jobs yourself, for they take specially trained men and a lot of time. But you can make a quick check to prove that harmonization and leveling have been done properly.

Usually the two jobs are done in a harmonization yard, where the plane is carefully "spotted" in the midst of a group of special boresighting targets. While the plane is in such a yard, you can check quickly by lining up the sight on its proper target and then using a boresighting tool to make sure the guns are lined up properly on the target.

If you aren't in a harmonization yard, you can use the field, or distant object method. Pick out some small object --- like a tree or chimney --- as far away as possible. Try to keep the distance between your line of sight and the line of the guns as small as possible, as shown in the diagram. Be sure the distance to the object you have selected is at least 1,000 times as great as the distance between your line of sight and the guns' line of bore.

(Diagram to clarify above paragraph.)

Line up the sight on your object and use a boresighting tool to make sure the guns are also pointing at it. If so, harmonization is okay.

Then turn the sight and guns in a half circle and pick out another small object off somewhere in the opposite direction. Follow the same rule about the distance of this object. If the sight and guns line up properly on this object, you know that the turret has been leveled properly.

(When the turrets are properly leveled, harmonization is correct no matter where you point your guns. When they are not properly leveled, harmonization will be correct when the guns point in one direction but wrong in other directions.)

A VISUAL INSPECTION OF THE SIGHTING STATION

Before you go on a mission, take a good look around your sighting station. Make sure the plexiglas blister is clean --- if not, wash it with soap and cool water, and remove grease with a little plain naphtha or kerosene. Examine the sight to make sure there are no loose or damaged cables or loose screws.

Make sure you have a seat cushion and any tools you are in the habit of taking into combat, and that there is a full supply of spare bulbs and spare fuses in the clips at your station.

Then take a look at the auxiliary units (oxygen, heated suit, and trouble light) and at your emergency equipment. Run down this list of questions:

1. Is your parachute in good condition and placed where you can get at it in a hurry?

2. Is your Mae West handy? Are its carbon dioxide cylinders still sealed?

3. Does your heated suit work? (Try it --- plug it in and make sure the rheostat controls the heat properly.)

4. Is your oxygen equipment okay? (Test it --- make sure the pressure gage shows the right pressure, as determined by your crew chief, then plug in your mask and make sure you get a flow of oxygen.)

5. Is the cabin pressure valve turned on?

6. Does your interphone work --- can you hear your crew mates and can they hear you?

A VISUAL INSPECTION OF THE TURRET

Another quick visual inspection --- which will often pay off by catching mistakes before it is too late --- should be made at the turret just before the mission. Run down this list of questions:

1. Are the guns mounted securely?

2. Are the chargers securely mounted to the guns?

3. Are all cotter pins and safety wiring in good condition --- not loose, rusty, or broken?

4. Are the air hoses for the gun chargers connected tightly?

5. Is the air compressor full of oil, right up to the top?

6. Take a good look at the whole turret. Does everything look all right? Are you sure there are no loose, bent or broken parts?

SECTION VI

PRE-FLIGHT, IN AIR, AND POST-FLIGHT CHECK LISTS

(Illustration: Half-page drawing of check list marked "O.K.")

The various steps in getting RCT ready for a mission, and making sure all the equipment is working properly, were described in full detail in Section V. Every one of these steps is absolutely essential -- you can never be sure your equipment will work in combat unless you have taken every one of the steps yourself or know for a fact that someone else has.

Remember this as you read the check lists in Section VI. You will note that the pre-flight check list is very brief, and does not include everything described in Section V. This is because there is seldom time, between briefing for a mission and the actual take off, to make a more thorough check. The list printed here is the absolute minimum -- it is simply a last minute check to make sure the equipment is working properly insofar as you can tell in the limited time you have.

The in air check is designed to prove once more that the equipment is working after you begin the flight, and that the guns are actually firing -- a test that cannot be made on the ground.

The post-flight check is designed simply to clear the guns and get them ready for cleaning.

These three checks must be made carefully, just as shown here. But remember that they don't cover all the ground. To be safe you must also be sure that the guns have been properly cleaned, reassembled, and adjusted; that the chargers have been adjusted and checked for leaks; that the turrets have been leveled and harmonized; that the ammunition has been checked and loaded properly; that the contour followers, fire interrupters, and limit stops have been checked; and that the computers are adjusted properly.

PRE-FLIGHT CHECK LIST

1. At your sighting station, make a thorough visual check as described on Page 5-17-1.

2. Turn on the power switches and check the sight as described on Page 5-8-1

3. Operate your primary turret with the computer at standby. (See page 5-9-1.)

4. Then operate the turret with the computer cut in. (See Page 5-12-1.)

5. Have someone go to the turret and make a thorough visual check. (See Page 5-18-1.)

6. Have your helper stand by the turret while you turn on the GUNS switch and press the triggers until the charger locks out. Have your helper make sure the charger and its air compressor are working properly and that the firing pins of theguns release. (See Page 5-4-1.)

7. Have your helper make sure the booster motors operate when you press the trigger.

8. Turn on the camera switch and press the trigger again. Have your helper make sure the camera begins operating, goes off after the proper overrun interval, and is adjusted properly. (See Page 5-7-1.)

9. Repeat steps 3 through 7 for all other turrets which you can operate.

10. In the turret you are responsible for loading, press the ammunition belts into the feedways, then charge the guns to move the first round against the cartridge stops.

11. Press the reset button on the gun chargers.

12. Load a fresh magazine into the camera.

13. Reset the gun chargers again, just to make sure.

14. Replace the turret gun enclosure and dome (or the housing of the tail mount) and make sure the turret well cover is on tight (or that the bulkhead door of the tail mount is closed). If you have been working on a turret with hand operated safety switches, make sure the switches are turned so that the turret will operate.

15. Be sure all stowing latches are closed.

WARNING: Never make this check without working closely by interphone with all gunners, so that everyone will know who is operating the turrets. Be particularly careful to check with your crew chief, who will have to supply auxiliary power to prevent wearing out the bomber's batteries.

The usual order for making the check on operation of the sighting stations and turrets (steps 3 through 9) is as follows:

First the top gunner checks the upper aft turret. Then he checks the upper forward turret.

As soon as the top gunner is finished, the nose gunner checks the upper forward turret and then the lower forward turret.

The side gunners then go to work. The right gunner checks the lower forward turret. Immediately afterward; the left gunner checks this turret and then goes on to check the lower aft turret. Then the right gunner goes back to work and checks the lower aft turret and finally the tail mount. After he finishes, the left gunner checks the tail mount.

The last man to make his check is the tail gunner, who checks the tail mount only.

IN AIR CHECK LIST

After the take-off, your airplane commander or top gunner will call for another check. Make it as follows:

1. Turn on the power switches and the computer, and turn the computer stand-by switch to in.

2. Make sure that every turret you can control in combat will follow your sight smoothly.

3. For your primary turret, turn the guns switch on (or have it turned on by the man who has the switch on his control box). Then, after getting permission from the airplane commander and carefully aiming away from other bombers in the formation, fire four test rounds from your caliber .50s to make sure the guns and chargers are working properly. (Do not fire the 20 mm cannon -- remember, you only have 125 rounds of 20 mm ammunition.)

4. Stow the turret and turn your control box switches to the position ordered by the pilot or top gunner. Usually you will leave on the POWER AUX, GUNS, POWER A.C. and COMPUTER, so that you can get ready for action simply by throwing on the POWER TURRET switch.